

What is claimed is:

1. A semiconductor module comprising:
  - a package substrate;
  - a plurality of power switching device chips having top  
5 surfaces and back surfaces and being mounted by flip chip  
bonding above said package substrate while letting said top  
surfaces face said package substrate;
  - a drive-use integrated circuit ("IC") chip mounted by  
flip chip bonding above said package substrate, configured  
10 to drive gates of transistors formed in said plurality of  
power switching device chips;
  - a plurality of heat sinks disposed above said back  
surfaces of said plurality of power switching device chips;  
and
  - 15 a resin member configured to seal said plurality of  
power switching device chips and said drive-use IC chip as a  
single package.
2. The semiconductor module according to claim 1,  
wherein at least one of said plurality of heat sinks is  
20 insulated from said drive-use IC chip and extends to overlie  
said drive-use IC chip.
3. The semiconductor module according to claim 2,  
wherein said drive-use IC chip is less in thickness than one  
of said power switching device chips having its back surface  
25 on which the heat sink extending to overlie said drive-use  
IC chip is disposed.
4. The semiconductor module according to claim 3,  
wherein said heat sink extending to overlie said drive-use  
IC chip is flat.
- 30 5. The semiconductor module according to claim 1,  
wherein said plurality of heat sinks are electrically  
connected respectively to source electrodes or drain  
electrodes of said back surfaces of corresponding ones of  
said plurality of power switching device chips and also  
35 electrically connected to terminals of said package  
substrate.

6. The semiconductor module according to claim 1,  
wherein a respective one of said plurality of heat sinks has  
a one surface and a remaining surface on the opposite side  
thereof, said one surface facing the back surface of a  
5 corresponding one of said plurality of power switching  
device chips, and wherein

said remaining surface is exposed to outside of said  
semiconductor module.

7. The semiconductor module according to claim 1,  
10 wherein gate electrodes and source electrodes are formed at  
said top surfaces of said plurality of power switching  
device chips, and wherein drain electrodes are formed at  
said back surfaces.

8. The semiconductor module according to claim 1,  
15 wherein said drive-use IC chip is not covered with the heat  
sinks.

9. The semiconductor module according to claim 1,  
wherein at least one of said plurality of power switching  
device chips has a diode as built therein, said diode being  
20 connected in parallel to one of said transistors.

10. The semiconductor module according to claim 1,  
wherein said plurality of heat sinks are entirely covered  
with said resin member.

11. A semiconductor module comprising:  
25 a package substrate;  
a power switching device chip having a top surface and  
a back surface and being mounted by flip chip bonding at  
said package substrate while letting said top surface face  
said package substrate;

30 a driver IC chip mounted by flip chip bonding at said  
package substrate, configured to drive a gate of a  
transistor formed in said power switching device chip;

a heat sink being disposed above said back surface of  
said power switching device chip and extending to overlie  
35 said driver IC chip; and

a sealing member configured to seal said power

switching device chip and said driver IC chip together as a one package.

12. A semiconductor module comprising:

a package substrate;

5 a power switching device chip having a top surface and a back surface and being mounted by flip chip bonding at said package substrate while letting said top surface face said package substrate;

a driver IC chip mounted by flip chip bonding at said  
10 package substrate, configured to drive a gate of a transistor formed in said power switching device chip;

a heat sink disposed above said back surface of said power switching device chip and electrically connected to said back surface and terminals of said package substrate;  
15 and

a resin member configured to seal said power switching device chip and said driver IC chip together as a one package.

13. A DC-DC converter including said semiconductor  
20 module according to claim 1.

14. A semiconductor device comprising:

said semiconductor module according to claim 1; and

a pulse width modulation (PWM) control IC chip  
configured to control driving of said gates by said drive-  
25 use IC chip.

15. A semiconductor device comprising:

a DC-DC converter including said semiconductor module according to claim 1;

a central processing unit (CPU) to which electrical  
30 power is supplied thereto by said DC-DC converter; and

another heat sink being disposed above said CPU and extending to reach a location covering said semiconductor module.